

REMARKS/ARGUMENTS

Favorable reconsideration of this application as currently amended and in view of the following remarks is respectfully requested.

Claims 1-24, 44-51, and 53-63 are presently active in this case. Claims 1, 8, 24, 46, and 51 have been amended and Claim 52 has been canceled by way of the present Amendment.

In the outstanding office action, the drawings and specification were objected to as failing to comply with 37 CFR 1.84(p)(5); Figures 33A, 33B, 34A, 34B, 35A, 35B, 36A, and 36B were objected for not including labeled axes; the abstract of the disclosure was objected to for exceeding 150 words; the specification was objected to; claim 55 was objected; claims 8, 13, and 59-61 were rejected under 35 USC 102(b) as being anticipated by PCT Publication Application No. WO99/45581 to Ota; claims 51, 54, 56, 57, 58, and 63 were rejected under 35 USC 102(b) as being anticipated by Japanese Patent Publication No. 11045846 to Taniguchi; claims 1-4, 6, 23, 46-50, and 62 were rejected under 35 USC 103(a) as being unpatentable over Ota in view of U.S. Patent No. 6,379,868 to White; claims 24 and 44 were rejected under 35 USC 103(a) as being unpatentable over U.S. Patent No. 5,594,549 to Mori et al.; and claim 45 was rejected under 35 USC 103(a) as being unpatentable over Mori et al. in view of White.

Applicants acknowledge with appreciation the indication of allowable subject matter. However, because Applicants believe that they are entitled to the scope of protection defined by claims 1, 8, 24, 46, and 51, claims 5, 7, 9-12, 14-22, 52, 53, and 55 have been maintained in dependent form.

In response to the objections to the drawings and specification for failing to comply with 37 CFR 1.84(p)(5), the specification has been amended to include description of step 217, and to clarify what reference signs P and RI describe. No new matter has been added.

The reference signs S and WZ have been deleted from Figure 31. Finally, the axes of the illustrated graphs in Figures 33A, 33B, 34A, 34B, 35A, 35B, 36A and 36B have been added. No further objection on the basis of 37 CFR 1.84(p)(5) is therefore anticipated.

In response to the objections to the specification, the abstract has been amended so that it does not exceed 150 words. The “exposure apparatus” feature has been properly identified. Finally, the term “SMP” on page 66, line 4 of the specification and all references to “AIS” have been deleted.

In response to the objection to claim 55, claim 51 has been amended to provide antecedent basis for the terms “said driving unit” and “said aerial image measurement unit.” No further claim objections are therefore anticipated.

Briefly recapitulating, the present invention is directed to a method and apparatus for measuring an aerial image of a mark formed by a projection optical system, the method including the steps of illuminating the mark with an illumination light, forming an aerial image of the mark on an image plane, arranging a pattern forming member which has at least one slit-shaped aperture pattern extending in a first direction within a two dimensional plane perpendicular to an optical axis of the projection optical system, a width of the at least one slit-shaped aperture pattern in a second direction perpendicular to the first direction being set in consideration of at least one of a wavelength λ of the illumination light and a numerical aperture of the projection optical system, scanning the pattern forming member in the second direction, photo-electrically converting the illumination light, and obtaining a photoelectric conversion signal. Applicants respectfully submit that none of the applied art discloses or suggests that a width of at least one slit-shaped aperture pattern of a pattern forming member in a second direction perpendicular to a first direction is set in consideration of at least one of a wavelength λ of an illumination light and a numerical aperture of the projection optical system.

WO 99/45581 merely describes sequentially irradiating a reticle alignment mark drawn on a reticle R with two illumination lights for exposure EL, detecting a projection image of the reticle alignment mark with respect to a wafer via a slit of an aerial image sensor FM, and obtaining a projection position at which a reticle pattern image is projected on a wafer surface.

JP11-045846 merely describes changing a focal position of a fiducial mark plate by a predetermined step amount via a driving mechanism for driving in a Z direction in a sample stage, and detecting contrast of detection signals obtained when scanning a projection image via slit in order to detect a position of an image plane (a best focal position) of a projection image of a mark.

US patent No. 6,379,868 merely describes a structure in which dark-field resolution enhancement is obtained by introducing radiation from a source onto a patterned mask.

Finally, US patent No. 5,594,549 merely describes a structure wherein by detecting the position upon an image pickup surface of an image pickup device 101 of an image projected of the wafer mark GW and the reference mark GS in the detection optical system 53, the reticle R and the wafer W are relatively and indirectly aligned with each other.

Further, none of the applied art is believed to teach or suggest a structure providing “arranging a pattern forming member ... in the vicinity of an image plane of said projection optical system” and “a width of said at least one slit-shaped aperture pattern in a second direction perpendicular to said first direction being set in consideration of resolution of said predetermined mark on said image plane” as defined by amended Claim 8.

Further, none of the applied art is believed to teach or suggest measuring a light intensity distribution corresponding to an aerial image at a first detection point within an effective field of an optical projection system and at a first position related to an optical axis direction of the projection optical system, and also measuring a light intensity distribution

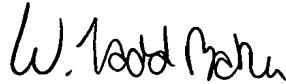
corresponding to an aerial image at a second detection point different from the first detection point within an effective field of the optical projection system and at a second position different from the first position related to an optical axis direction of the projection optical system, as defined by amended Claim 24.

Consequently, the applied prior art is not believed to anticipate or render obvious the subject matter of the present invention when considered alone or in combination with one another.

An early and favorable action is respectfully requested.

Respectfully submitted,

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